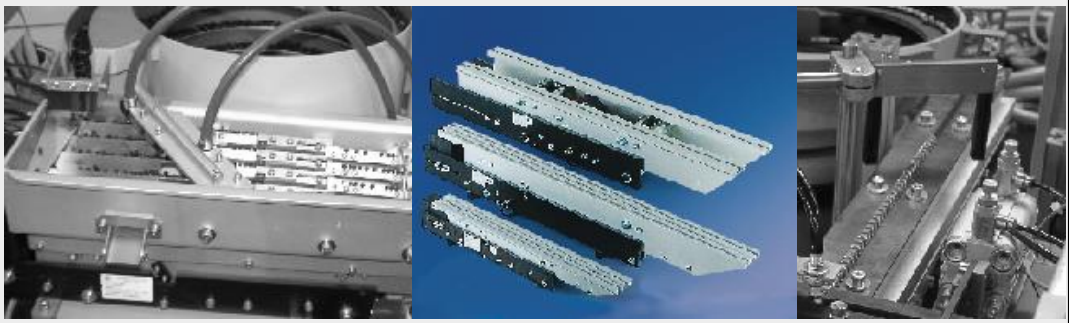

Operating instructions

Linear feeder

SLL 175
SLL 400
SLL 800
SLL 804
SLF 1000

BA

Rhein-Nadel Automation GmbH

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Declaration of conformity
as defined by
Low voltage directive 2006/95/EC

Herewith we declare that the product complies with the following provisions:

Low voltage directive 2006/95/EC

applied harmonized standards: DIN EN 60204 T1

remarks:

We assume that our product is to be integrated in a fixed machine. The provisions of the EMC directive 2004/108/EC has to be considered by the user.

Rhein-Nadel-Automation

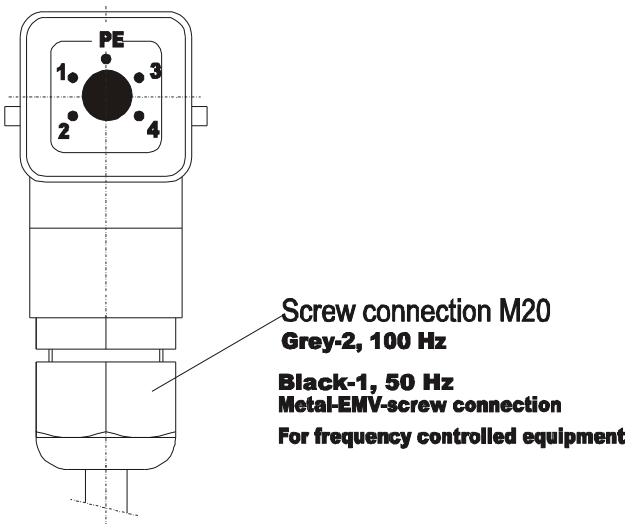
Managing Director
Jack Grevenstein

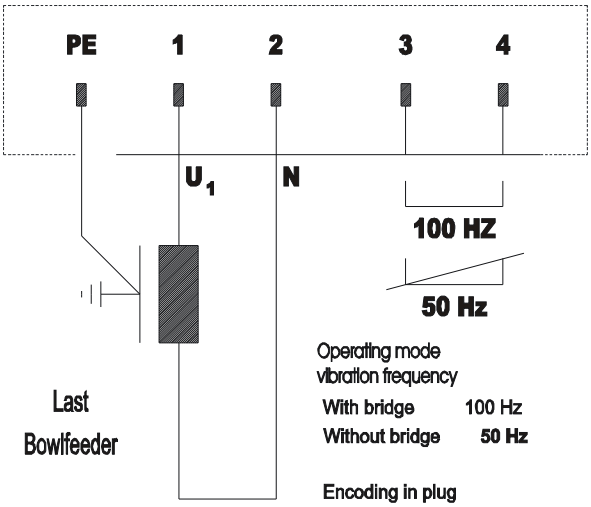
CE

1 Technical data

Notice
All linear feeders listed in the table may only be operated in connection with a RNA control unit at a mains voltage of 230V/50Hz.. Special voltages and frequencies see separate data sheet.

Pin assignment





With bridge: The bridge has to be installed in connection 3 + 4

Linear feeder type SLL 175

Linear feeder type	SLL 175-175	SLL 175-250
Dimensions L x B [2] x H (mm)	200x62x63	275x62x63
Weight	1,2	1,4
Insulation type	IP54	IP54
Connecting cable length (m)	1.800	1.800
Power consumption [1] (VA)	16	16
Current consumption [1] (A)	70 mA	70 mA
Magnet nominal voltage [1] / Frequency (V / Hz)	200/50	200/50
Number of magnets	1	1
Magnet type	WZAW010	
Magnet colour	black	
Air gap (mm)	1,0	1,0
Vibration frequency Hz	100 Hz	
Number of spring assemblies	2	2
Standard no. of springs Number per spring assembly	1x1,25 / 1x1,5/ 1x1,0 / 1x0,75	2x1,25 / 1x1,5/ 1x1,0 / 1x0,75
Spring dimensions (mm) Length (gauge for boreholes) x width	44,3(35)x26,7(12)	44,3(35)x26,7(12
Spring size (mm)	0,75 – 1,5	0,75 – 1,5
Quality of the spring fastening screws	8.8	8.8
Tightening moment of the spring fastening screws	300 Ncm	300 Ncm
Max. weight of the oscillating units (linear track) dependent on the mass moment of inertia and required running speed	1300 g	1500 g
Max. track length (mm)	325	400
Max. useful weight of the linear feeder dependent on the mass moment of inertia and required running speed	400 – 500 g	500 – 600 g

Linear feeder type SLL 400

Linear feeder type	SLL 400 - 400	SLL 400 - 600	SLL 400 - 800	SLL 400 - 1000
Dimensions L x B [2] x H (mm)	430 x 84 x 103	630 x 84 x 103	830 x 84 x 103	1030x84x103
Weight	6,5	8	10	12,5
Insulation type	IP 54	IP 54	IP 54	IP 54
Connecting cable length (m)	1,5	1,5	1,5	1,5
Power consumption [1] (VA)	120	120	120	120
Current consumption [1] (A)	0,6	0,6	0,6	0,6
Magnet nominal voltage [1] / Frequency (V / Hz)	200 / 50	200 / 50	200 / 50	200 / 50
Number of magnets	1	1	1	1
Magnet type	WZAW 040			
Magnet colour	black			
Air gap (mm)	1,0	1,0	1,0	1,0
Vibration frequency Hz	100 Hz			
Number of spring assemblies	2	2	3	4
Standard no. of springs Number per spring assembly	2 x 2,0 3 x 3,0	2 x 2,0 4 x 3,0	2 x 2,0 4 x 3,0	3 x 2,0 5 x 3,0
Spring dimensions (mm) Length (gauge for boreholes) x width	70(56) x 40(18)	70(56) x 40(18)	70(56) x 40(18)	70(56) x 40(18)
Spring size (mm)	2,0 und 3,0	2,0 und 3,0	2,0 und 3,0	2,0 und 3,0
Quality of the spring fastening screws	8.8	8.8	8.8	8,8
Tightening moment of the spring fastening screws	15 Nm	15 Nm	15 Nm	15 Nm
Max. weight of the oscillating units (linear track) dependent on the mass moment of inertia and required running speed	ca. 5 kg	ca. 6 kg	ca. 7 kg	ca. 8 kg
Max. track length (mm)	700	900	1.100	1.300
Max. useful weight of the linear feeder dependent on the mass moment of inertia and required running speed	1,5 – 2 kg	1,5 – 2 kg	1 - 1,5 kg	1 – 1,5 kg

Linear feeder type SLF 1000

Linear feeder type	SLF 1000-1000	SLF 1000-1500
Dimensions L x B [2] x H (mm)	1.100 x 244 x 178	1.600 x 244 x 178
Weight	62	80
Insulation type	IP 54	IP 54
Connecting cable length (m)	2	2
Power consumption [1] (VA)	504	1.004
Current consumption [1] (A)	2.51	5,0
Magnet nominal voltage [1] / Frequency (V / Hz)	200 / 50	200 / 50
Number of magnets	2	4
Magnet type	YZAW 080	
Magnet colour	red	
Air gap (mm)	2,5	2,5
Vibration frequency Hz	50 Hz	
Number of spring assemblies	2	3 (4)[3]
Standard no. of springs Number per spring assembly	8 x 3,5	12 x 3,5
Spring dimensions (mm) Length (gauge for boreholes) x width	128(108) x 160(2x60)	128(108) x 160(2x60)
Spring size (mm)	3,5	3,5
Quality of the spring fastening screws	8.8	8.8
Tightening moment of the spring fastening screws	60 Nm	60 Nm
Max. weight of the oscillating units (linear track) dependent on the mass moment of inertia and required running speed	ca. 40 kg	ca. 70 kg
Max. track length (mm)	2.000	2.500
Max. useful weight of the linear feeder dependent on the mass moment of inertia and required running speed	20 – 30 kg	40 – 50 kg

Linear feeder type SLL 800

Linear feeder type	SLL 800 - 800	SLL 800 - 1000	SLL 800 - 1200	SLL 800 - 1400
Dimensions L x B [2] x H (mm)	850 x 120 x 162	1.050 x 120 x 162	1.250 x 120 x 162	1.450 x 120 x 162
Weight	18,5 kg	20,5 kg	23,5 kg	24,0 kg
Insulation type	IP 54	IP 54	IP 54	IP 54
Connecting cable length (m)	2	2	2	2
Power consumption [1] (VA)	251	251	251	251
Current consumption [1] (A)	1,26	1,26	1,26	1,26
Magnet nominal voltage [1] / Frequency (V / Hz)	200 / 50	200 / 50	200 / 50	200 / 50
Number of magnets	1	1	1	1
Magnet type	YZAW 080			
Magnet colour	red			
Air gap (mm)	3,0	3,0	3,0	3,0
Vibration frequency Hz	50 Hz			
Number of spring assemblies	2	2	2	2
Standard no. of springs Number per spring assembly	1 x 2,5 5 x 3,5	1 x 2,5 5 x 3,5	1 x 2,5 6 x 3,5	1 x 2,5 6 x 3,5
Spring dimensions (mm) Length (gauge for boreholes) x width	108(90) x 55(25)	108(90) x 55(25)	108(90) x 55(25)	108(90) x 55(25)
Spring size (mm)	2,5 ; 3,5	2,5; 3,5	2,5; 3,5	2,5; 3,5
Quality of the spring fastening screws	8.8	8.8	8.8	8.8
Tightening moment of the spring fastening screws	30 Nm	30 Nm	30 Nm	30 Nm
Max. weight of the oscillating units (linear track) dependent on the mass moment of inertia and required running speed	ca. 11 kg	ca. 13 kg	ca. 15 kg	ca. 17 kg
Max. track length (mm)	1.100	1.300	1.500	1.700
Max. useful weight of the linear feeder dependent on the mass moment of inertia and required running speed	4 - 8 kg	4 – 8	6 - 10	6 - 10

Linear feeder type	SLL 800 - 1600	SLL 800 - 1800	SLL 800 - 2000	SLL 804 - 2400
Dimensions L x B [2] x H (mm)	1.650 x 120 x 162	1.850 x 120 x 162	2.050 x 120 x 162	2.450 x 120 x 172
Weight	31,5	34,0	39,5	63
Insulation type	IP 54	IP 54	IP 54	IP 54
Connecting cable length (m)	2	2	2	2
Power consumption [1] (VA)	251	251	251	502
Current consumption [1] (A)	1,26	1,26	1,26	2,51
Magnet nominal voltage [1] / Frequency (V / Hz)	200 / 50	200 / 50	200 / 50	200 / 50
Number of magnets	1	1	1	2
Magnet type	YZAW 080			
Magnet colour	red			
Air gap (mm)	3,0	3,0	3,0	3,0
Vibration frequency Hz	50 Hz			
Number of spring assemblies	3	3	3	4
Standard no. of springs Number per spring assembly	2 x 2,5 7 x 3,5	2 x 2,5 7 x 3,5	2 x 2,5 9 x 3,5	2 x 2,5 14 x 3,5
Spring dimensions (mm) Length (gauge for boreholes) x width	108(90) x 55(25)	108(90) x 55(25)	108(90) x 55(25)	108(90) x 55(25)
Spring size (mm)	2,5; 3,5	2,5; 3,5	2,5; 3,5	2,5; 3,5
Quality of the spring fastening screws	8.8	8.8	8.8	8.8
Tightening moment of the spring fastening screws	30 Nm	30 Nm	30 Nm	30 Nm
Max. weight of the oscillating units (linear track) dependent on the mass moment of inertia and required running speed	ca. 19 kg	ca. 21 kg	ca. 23 kg	ca. 51 kg
Max. track length (mm)	1.900	2.100	2.300	2.700
Max. useful weight of the linear feeder dependent on the mass moment of inertia and required running speed	6 – 10 kg	6 – 10 kg	6 – 10 kg	10 – 12 kg

[1] At special connecting values (voltage/frequency see type plate at the magnet

[2] Width dimension for design b (= wide)

Linear feeder type SLL 804

Linear feeder type	**SLL 804 - 800**	**SLL 804 - 1000**	**SLL 804 - 1200**	**SLL 804 - 1400**
Dimensions L x B [2] x H (mm)	850 x 120 x 172	1.050 x 120 x 172	1.250 x 120 x 172	1.450 x 120 x 172
Weight	21,5	24,5	27,5	29,5
Insulation type	IP 54	IP 54	IP 54	IP 54
Connecting cable length (m)	2	2	2	2
Power consumption [1] (VA)	251	251	251	251
Current consumption [1] (A)	1,26	1,26	1,26	1,26
Magnet nominal voltage [1] / Frequency (V / Hz)	200 / 50	200 / 50	200 / 50	200 / 50
Number of magnets	1	1	1	1
Magnet type	YZAW 080			
Magnet colour	red			
Air gap (mm)	3,0	3,0	3,0	3,0
Vibration frequency Hz	50 Hz			
Number of spring assemblies	2	2	2	2
Standard no. of springs Number per spring assembly	1 x 2,5 6 x 3,5	2 x 2,5 5 x 3,5	4 x 2,5 6 x 3,5	2 x 2,5 8 x 3,5
Spring dimensions (mm) Length (gauge for boreholes) x width	108(90) x 55(25)	108(90) x 55(25)	108(90) x 55(25)	108(90) x 55(25)
Spring size (mm)	2,5 / 3,5	2,5 / 3,5	2,5 / 3,5	2,5 / 3,5
Quality of the spring fastening screws	8.8	8.8	8.8	8.8
Tightening moment of the spring fastening screws	30 Nm	30 Nm	30 Nm	30 Nm
Max. weight of the oscillating units (linear track) dependent on the mass moment of inertia and required running speed	21 kg	25 kg	28 kg	32 kg
Max. track length (mm)	1.100	1.300	1.500	1.700
Max. useful weight of the linear feeder dependent on the mass moment of inertia and required running speed	12 – 15 kg	12 – 15 kg	12 – 15 kg	12 – 15 kg
Linear feeder type	**SLL 804 - 1600**	**SLL 804 - 1800**	**SLL 804 - 2000**	**SLL 804 - 2800**
Dimensions L x B [2] x H (mm)	1.650 x 120 x 172	1.850 x 120 x 172	2.050 x 120 x 172	2.850 x 120 x 172
Weight	39,5	43,0	49,5	76
Insulation type	IP 54	IP 54	IP 54	IP 54
Connecting cable length (m)	2	2	2	2
Power consumption [1] (VA)	502	502	502	502
Current consumption [1] (A)	2,51	2,51	2,51	2,51
Magnet nominal voltage [1] / Frequency (V / Hz)	200 / 50	200 / 50	200 / 50	200 / 50
Number of magnets	2	2	2	2
Magnet type	YZAW 080			
Magnet colour	red			
Air gap (mm)	3,0	3,0	3,0	3,0
Vibration frequency Hz	50 Hz			
Number of spring assemblies	3	3	3	4
Standard no. of springs Number per spring assembly	4 x 2,5 9 x 3,5	4 x 2,5 9 x 3,5	4 x 2,5 11 x 3,5	2 x 2,5 14 x 3,5
Spring dimensions (mm) Length (gauge for boreholes) x width	108(90) x 55(25)	108(90) x 55(25)	108(90) x 55(25)	108(90) x 55(2)
Spring size (mm)	2,5; 3,5	2,5; 3,5	2,5; 3,5	2,5; 3,5
Quality of the spring fastening screws	8.8	8.8	8.8	8.8
Tightening moment of the spring fastening screws	30 Nm	30 Nm	30 Nm	30 Nm
Max. weight of the oscillating units (linear track) dependent on the mass moment of inertia and required running speed	36 kg	40 kg	44 kg	ca. 62 kg
Max. track length (mm)	1.900	2.100	2.300	3.100
Max. useful weight of the linear feeder dependent on the mass moment of inertia and required running speed	12 – 15 kg	12 – 15 kg	12 – 15 kg	10 – 12 kg

[1] At special connecting values (voltage/frequency see type plate at the magnet

[2] Width dimension for design b (= wide)

2. Safety instructions

The conception and production of our linear feeders has been carried out very carefully, in order to guarantee trouble-free and save operation. You too can make an important contribution to job safety. Therefore, please read this short operating instructions completely, before starting the machine. Always observe the safety instructions!

Make sure that all persons working with or at this machine carefully read and observe the following safety instructions!

This operating instruction is only valid for the types indicated on the front page.

Notice
This hand points to information that gives you useful tips for the operation of the linear feeder.

Attention
This warning triangle marks the safety instructions. Non-observance of these warnings can result in serious or fatal injuries!

Dangers occuring at the machine

- The most dangerous parts of the machine are the electrical installations of the linear feeder. In case the linear feeder gets wet, there is the danger of an electric shock!
- Make sure that the predector ground of the electric power supply is in perfect condition!

Intended use

The intended use of the linear feeder is the actuation of conveying tracks. These are used for linear transport and feeding of correctly positioned mass-produced parts, as well as for the proportioned feeding of bulk material.

The intended use also includes the observance of the operating and servicing instructions.

Please take the technical data of your linear feeder from the table "technical data" (see chapter 1). Make sure that the connected load of the linear feeder, control unit and power supply is compatible.

Notice
The linear feeder may only be operated in perfect condition!

The linear feeder may not be operated in the explosive or wet area.

The linear feeder may only be operated in the configuration drive unit, control unit and oscillating unit, as specified by the manufacturer.

No additional loads may act upon the linear feeder, apart from the material to be transported, for which the special type is designed.

Attention
It is strictly prohibited to put any safety devices out of operation!

Demands on the user

- For all activities (operation, maintenance, repair, etc.) the details of the operating instructions must be observed.
- The operator must avoid any working method which would impair the safety of the linear feeder.
- The operator must take care that only authorized personnel works at the linear feeder.
- The user is obliged to inform the operator immediately about any changed conditions at the linear feeder that could endanger safety**.**

Attention
The linear feeder may only be installed, put into operation and serviced by expert personnel. The binding regulation for the qualification of electricians and personnel instructed in electrical engineering is valid, as defined in IEC 364 and DIN VDE 0105 part 1.

Attention:
Since the electromaget-field may have an impact on persons arrying pacemakers it is recommended to keep a minimum distance of 25 cm.

Noise emission
The noise level at the place of operation depends on the complete equipment and the material to be transported. The determination of the noise level according to the EC-Regulations "Machinery" can therefore only be carried out at the place of operation.
If the noise level at the place of operation exceeds the limit permitted, noise predection hoods may be used, which we offer as accessory parts (see catalogue).

Standards and regulations
The device was built according to the following standards and regulations:

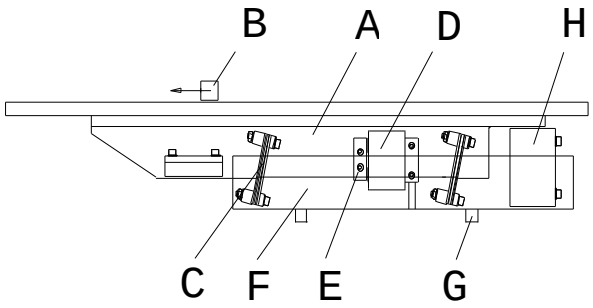
- Low voltage directive 2006/95/CE
- EMC directive 2004/108/CE

We assume that our product is to be
integrated in a fixed machine. The provisions of the EMC directive 2004/108/CE has to be considered by the user.

- Applied harmonized Standards
  EN 60204, T.1

3 Construction and function of the linear feeder

Linear feeders are used for the actuation of conveying equipments. The actuation takes place by an electromagnet. The following schematic diagram shows the function of a linear feeder:



A Conveying track and oscillating weight
B Material to be conveyed
C Spring assembly
D Drive magnet
E Armature
F Counterweight
G Shock absorber
H Countermass

The linear feeder is a device of the familiy of vibratory bowl feeders. It is, however, equipped with a linear conveyor. Electromagnetic vibrations are converted into mechanical vibrations and are used for conveying material B. If magnet D, which is securely connected with the countermass F, is supplied with current, it generates a power that, dependent on the vibration frequency of the mains supply, attracts and releases armature E. Within a period of the 50 Hz of the A.C. network the magnet achieves its maximum power of attraction twice, as this is independent of the direction of the current conduction. The vibration frequency therefore is 100 Hz. In case a half-wave is locked, it is 50 Hz. Please take the vibration frequency of your linear feeder of the table "technical data" in chapter 1.

A linear feeder is a resonant system (spring-mass-system). The result is that the adjustment made at the factory will rarely meet your requirements. Chapter 5 describes in detail how your linear feeder is adapted to your requirements.

Controlling of the linear feeder takes place by a low loss electronic control unit type ESG2000 or type ESG 1000. The control unit of the linear feeder is separately delivered. At its front panel it is provided with a 7-pole plug-in connection, by which it is connected to the linear feeder.

The pin assignment of the socket is shown in the table "technical data" (chapter 1).

Notice
Detailed information on the complete range of control units may please be taken from the operating instructions for control units..

All control units have got two main operating elements:

- By the mains switch the linear feeder is switched on or off.
- By the turning knob the conveying capacity of the transport unit is set.

4 Transport and mounting

Transport

Notice
Take care that the linear feeder cannot dash against other things during transport.

The weight of the linear feeder is please taken from the table "technical data" (chapter 1).

Mounting
The linear feeder should be mounted on a stable substructure (available as an accessory part) at the place where it is used. The substructure must be dimensioned in a way that no vibrations of the linear feeder can be carried away.

Linear feeders are fastened to the shock absorbers from below (part G in the general drawing chap. 3). The following table will give you a summary of the bore data of the various types:

Linear feeder type	Length in mm	Width in mm	Shock absorber thread
SLL 175-175	125	37	M3
SLL 175-250	175	37	M3
SLL 400 - 400	200	60	M 4
SLL 400 - 600	300	60	M 4
SLL 400 - 800	450	60	M 4
SLL 400 - 1000	500	60	M 4
SLL 800 - 800	300	83	M 6
SLL 800 - 1000	450	83	M 6
SLL 800 - 1200	600	83	M 6
SLL 800 - 1400	750	83	M 6
SLL 800 - 1600	900	83	M 6
SLL 800 - 1800	1.050	83	M 6
SLL 800 - 2000	1.200	83	M 6
SLL 804 - 800	300	87	M 8
SLL 804 - 1000	450	87	M 8
SLL 804 - 1200	600	87	M 8
SLL 804 - 1400	750	87	M 8
SLL 804 - 1600	900	87	M 8
SLL 804 - 1800	1050	87	M 8
SLL 804 - 2000	1200	87	M 8
SLL 804 - 2400	1500	87	M 8
SLL 804 - 2800	1800	87	M 8
SLF 1000-1000	370	130	M 10
SLF 1000-1500	870	130	M 10

Tabelle: Bohrdaten

Make sure that the linear feeder cannot come into contact with other devices during operation.

Further details on the control unit (bore plan, etc.) can be taken from the operating instructions of the control unit separately delivered.

5 Starting

Notice
Ensure that the frame (stand, base, frame etc.) is connected with the ground wire. (PE) If necessary, predection earthing on spot should be provided.

Check, whether

- the linear feeder stands in an isolated position and does not come in securely with a solid body
- the linear track is screwed down and adjusted
- the connecting cable of the linear feeder is plugged in at the control unit.

Attention
The electric connection of the linear feeder may only be made by trained personnel (electricians)! In case modifications are made at the electric connection, it is absolutely necessary to observe the operating instructions "control units".

- The available supply voltage (frequency, voltage, output) is in accordance with the connection data of the control unit (see type plate at the control unit).

Plug in the mains cable of the control unit and switch on the control unit by the mains switch.

Notice
At linear feeders which are delivered as a completely adjusted system, the optimal conveying capacity is already set at the factory. It is marked on the scale of the turning knob with a red arrow. In this case set the turning knob to the marking..

The optimal operative range of the linear feeder is at a controller position of 80% at the control unit. In case of higher deviations (≥±15%) a readjustment should be carried out.

5.2 Adjustment

with spring assemblies for a conveying track weight, which is approx. 25 % lower than the maximum track weight described in the Technical Data (chapt. 1), and a running speed of 4 - 6 m/min. In case heavier or lighter conveying tracks are installed or considerably faster or slower conveying speeds are required, the spring assemblies must be modified. For that the following basic rules have to be observed:

Notice
At first a rough adjustment of the conveying speed (adjustment of the natural frequency) must be made, which is followed by the adjustment of the running behaviour. Finally you adjust the conveying speed (natural frequency).

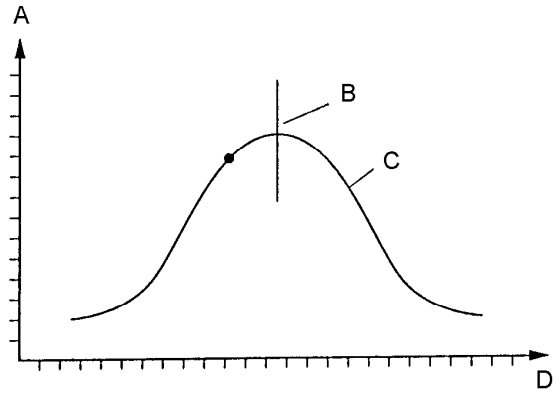
5.2.1 Adjusting the required running speed

In case the required running speed is not achieved with the standard spring assembly, the current adjustment range of the oscillating system must at first be found out, either **natural frequency below 50 or 100 Hz or natural frequency above 50 or 100 Hz.**

For that one or two plates are dismounted from the movable counterweight for a trial. If a change in the running speed on the conveying track is recognized, it can be taken from the table below, whether springs must be installed or removed. The controller position at the control unit may not be changed during this trial. In the factory the different sizes are equipped.

Change of the running speed on the conveying track after dismounting the counterweight	Required running speed is to be increased	Required running speed is to be reduced	Position of the natural frequency
Slower	1. Install counter weight 2. Dismount springs	1. Install counter weight 2. Dismount springs	> 50 or 100 Hz
Faster	1. Install counter weight 2. Install springs	1. Install counter weight 2. Dismount springs	< 50 or 100 Hz

The following graphic chart shows the resonance curve of a linear feeder:



A *Conveying speed*
B *Natural frequency*
C *Resonance curve (not true to scale)*
D *Spring power (number of springs)*

Notice
The resonance curve of the linear feeder may not correspond to the mains frequency.

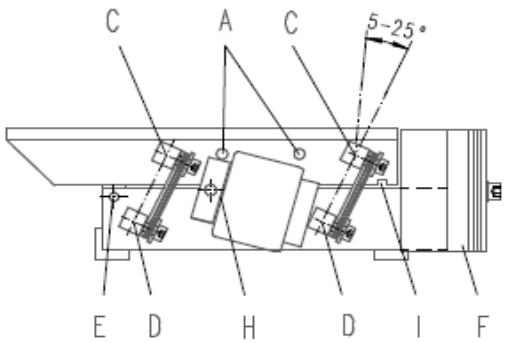
When exchanging the springs the valency of the various leaf spring sizes must be considered. As the spring size enters into the spring power in square, the following examples must be ovserved:

- 2.5 mm spring size = 6.25 spring power
- 3.0 mm spring size = 9.0 spring power
- 3.5 mm spring size = 12.25 spring power

A 3.5 mm leaf spring has about the same valency as two 2.5 mm leaf springs. For that reason it is recommendable to carry out the final or fine adjustment always with thin leaf springs.

Notice
When changing the masses of counter and oscillating weights (installation or dismounting of counter or additional weights) the running speed or the natural frequency of the linear feeder is changed. If necessary leaf springs must be added or removed.

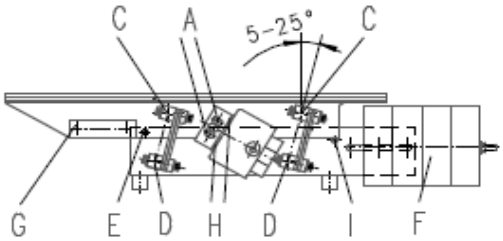
Changing the spring assembly for linear feeders type SLL 175



Unscrew the 4 upper lateral spring fastening screws (“C”)(M4 DIN 912). The complete oscillator with mounted track can now be lifted upwards.
Remove the desired spring pack by releasing the lower lateral spring fastening screws (“D”)(M4 DIN 912).
Before removing the spring pack, the protective conductor on the feeding side has to be taken out from the lower spring fixture.
Screw the removed spring pack into the mounting device for fitting springs size 175 and fasten it in a vise. When installing and removing the laminated springs, make sure there are little distance plates between the springs.
If you do not have a mounting device for spring packs, proceed as follows:
Fix the dismounted spring pack horizontally in a parallel vise with smooth clamping jaws and perform the desired adjustments. When tightening the spring packs, make sure they are in parallel alignment.
The mounting device aligns the two spring fixtures to one another. The fastening screws of the springs are to be tightened with a torque of 3.5 Nm.
Reinstall the complete spring pack.
To restore the former alignment of the linear feeder, the adjusting bore on the upper counter mass end (“E”) has to be aligned to the oscillator with a pin (4 mm in diameter with a minimum length of 45 mm).

On the feeding side, the oscillator is aligned near the counterweight by inserting another pin (4 mm in diameter with a minimum length of 45 mm) into the adjusting bore (“I”).
After having adjusted the spring angle to the desired position, the lateral fixing screws are tightened again with a torque of 3.5 Nm.
Before putting into operation again, please remember to remove the centering pins.

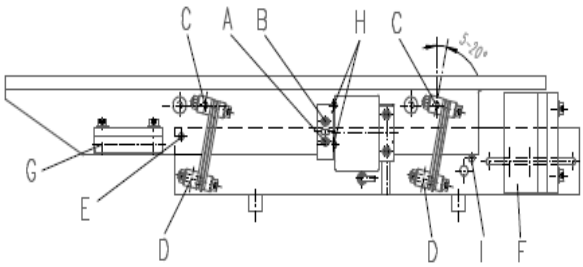
Changing the spring assembly for linear feeders type SLL 400



Unscrew the 4 or 6 upper lateral spring fastening screws (“C”)(M6 DIN 912). The complete oscillator with mounted track can now be lifted upwards. Remove the desired spring pack by releasing the lower lateral spring fastening screws (“D”)(M6 DIN 912).

Before removing the spring pack, the protective conductor on the feeding side has to be taken out from the lower spring fixture.
Screw the removed spring pack into the mounting device for fitting springs size 400 and fasten it in a vise. When installing and removing the laminated springs, make sure there are little distance plates between the springs.
If you do not have a mounting device for spring packs, proceed as follows:
Fix the dismounted spring pack horizontally in a parallel vise with smooth clamping jaws and perform the desired adjustments. When tightening the spring packs, make sure they are in parallel alignment.
The mounting device aligns the two spring fixtures to one another. The fastening screws of the springs are to be tightened with a torque of 12.5 Nm.
Reinstall the complete spring pack.
To restore the former alignment of the linear feeder, the adjusting bore on the upper counter mass end (“E”) has to be aligned to the oscillator with a pin (6 mm in diameter with a minimum length of 70 mm).
On the feeding side, the oscillator is aligned near the counterweight by inserting another pin (6 mm in diameter with a minimum length of 70 mm) into the adjusting bore (“I”).
After having adjusted the spring angle to the desired position, the lateral fixing screws are tightened again with a torque of 12.5 Nm.
Before putting into operation again, please remember to remove the centering pins.

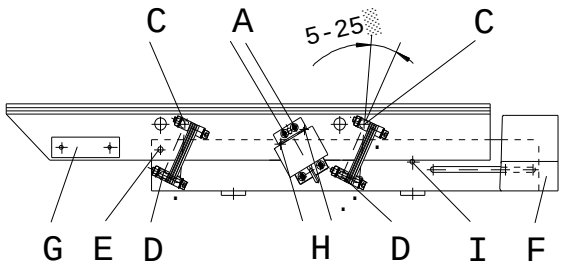
Changing the spring assembly for linear feeders type SLL 800 und SLL 804



Unscrew the lower armature fixing screw (“A”) (M6 DIN 912). Unscrew the 4 or 6 upper lateral spring fastening screws (“C”)(M8 DIN 912). The complete oscillator with mounted track can now be lifted upwards.
Remove the desired spring pack by releasing the lower lateral spring fastening screws (“D”)(M8 DIN 912).
Before removing the spring pack, the protective conductor on the feeding side has to be taken out from the lower spring fixture.
Screw the removed spring pack into the mounting device for fitting springs size 800 and fasten it in a vise. When installing and removing the laminated springs, make sure there are little distance plates between the springs.
If you do not have a mounting device for spring packs, proceed as follows:

Fix the dismounted spring pack horizontally in a parallel vise with smooth clamping jaws and perform the desired adjustments. When tightening the spring packs, make sure they are in parallel alignment.
The mounting device aligns the two spring fixtures to one another. The fastening screws of the springs are to be tightened with a torque of 30 Nm.
Reinstall the complete spring pack.
To restore the former alignment of the linear feeder, the adjusting bore on the upper counter mass end (“E”) has to be aligned to the oscillator with a pin (8 mm in diameter with a minimum length of 100 mm).
On the feeding side, the oscillator is aligned near the counterweight by inserting another pin (8 mm in diameter with a minimum length of 100 mm) into the adjusting bore (“I”).
After having adjusted the spring angle to the desired position, the lateral fixing screws are tightened again with a torque of 30 Nm.
Before putting into operation again, please remember to remove the centering pins.

Changing the spring assembly for linear feeders type SLF 1000



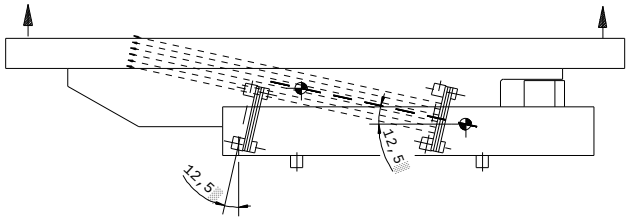
Unscrew the 4 upper lateral spring fastening screws (“C”)(M12 DIN 912). The complete oscillator with mounted track can now be lifted upwards.
Remove the desired spring pack by releasing the lower lateral spring fastening screws (“D”)(M12 DIN 912).
Before removing the spring pack, the protective conductor on the feeding side has to be taken out from the lower spring fixture.
Screw the removed spring pack into the mounting device for fitting springs size 1000 and fasten it in a vise. When installing and removing the laminated springs, make sure there are little distance plates between the springs.
If you do not have a mounting device for spring packs, proceed as follows:
Fix the dismounted spring pack horizontally in a parallel vise with smooth clamping jaws and perform the desired adjustments. When tightening the spring packs, make sure they are in parallel alignment.
The mounting device aligns the two spring fixtures to one another. The fastening screws of the springs are to be tightened with a torque of 80 Nm.
Reinstall the complete spring pack.
To restore the former alignment of the linear feeder, the adjusting bore on the upper counter mass end (“E”) has to be aligned to the oscillator with a pin (12 mm in diameter with a minimum length of 210 mm).
On the feeding side, the oscillator is aligned near the counterweight by inserting another pin (12 mm in diameter with a minimum length of 210 mm) into the adjusting bore (“I”).
After having adjusted the spring angle to the desired position, the lateral fixing screws are tightened again with a torque of 80 Nm.
Before putting into operation again, please remember to remove the centering pins.

Notice
If the base plate of the linear feeder is designed in a way that cross fastenings are only installed in the area of the rubber-metal feet, the spring assemblies can be dismounted individually from below without dismounting the vibrator.

5.2.2 Adjusting the required running behaviour or the sychronism of the linear feeder track

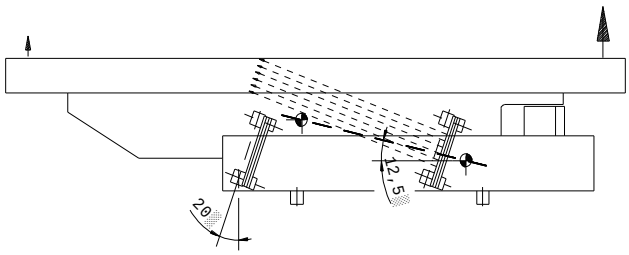
In order to achieve synchronism of the linear feeder track, the spring angle must be adjusted the same as the gravity center angle. The gravity center angle is determined by the position of the two gravity centers of oscillating and counterweight.

Example with a gravity center angle of 12.5 °



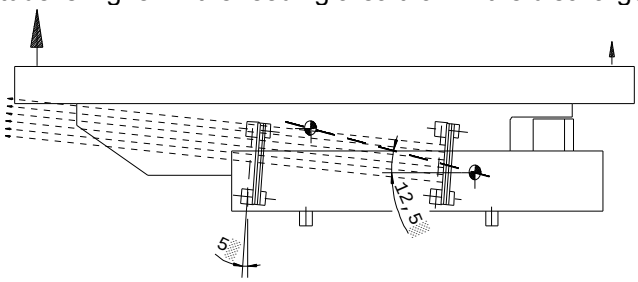
Spring angle equals gravity center angle

The force direction of the springs is initiated exactly on the gravity center of the vibrator. Consequence: The height amplitude is the same at the feeding and at the discharge side..



Spring angle larger than the gravity center angle

The force direction of the springs is initiated before the gravity center of the vibrator. Consequence: The height amplitude is higher in the feeding area than in the discharge area.



Spring angle is smaller than the gravity center angle

The force direction of the springs is initiated behind the gravity center of the vibrator. Consequence: The height amplitude is smaller in the feeding area than in the discharge area.

In case the angles are not the same, the conveying tracks are running unsteadily. In case of very high deviations of this angle the conveying track can even show lateral deflections (oscillations).

The gravity centers or angles can be influenced by the following measures:

- Add or displace counterweight ("F")
- Choose the track position and height in a way that a favourable gravity center is achieved
- Keep the track weight as low as possible, in order to keep the vibrator gravity center as low as possible.
- Install an additional counterweight in the vibrator discharge area ("G").
- Adjust the spring angle to the gravity center angle

The spring angle of the linear feeders type SLL 175, SLL 400 and SLF 1000 can be adjusted between 5° and 25° or at the linear feeders type SLL 800 and SLL 804 between 5° and 20°. If the gravity center angle is outside this area, synchronism of this track is impossible. In this case modifications must be made at the counter and oscillating weight gravity centers according to the points listed above.

Spring angle adjustment
Fix the vibrator towards the counter mass (see chapt. 5.2 "Changing the spring assemblies at the individual linear feeders"). After that the four lateral spring fastenings ("C" + "D") can be loosened, in order to swing the spring assembly into the desired spring angle. After that fasten the spring fastening screws with the permissible tightening torque (see "Technical Data", chapt. 1) and remove the adjusting screws, distance plates or bolts.

Adjustment of the magnet air gap

The air gap between armature and magnet adjusted in the factory can be taken from the "Technical Data" (chapt. 1)

The adjustment of the air gap can be made from the outside without dismounting any component parts. Slightly loosen both armature fastening screws ("A" or "A" + "B") (M4 DIN 912 at linear feeder type SLL 175; M5 DIN 912 at linear feeder type SLL 400: M6 DIN 912 at linear feeder type SLL 800 and SLL 804; M6 DIN 912 at linear feeder type SLF 1000 at the right and left side). In both bore holes in the oscillating profile ("H") a round pin (ϕ 1mm, 80 mm long at SLL 400; ϕ 3 mm; 80 mm long at SLL 800 and SLL 804; ϕ 2.5 mm, 250 mm long at SLF 1000) must be sticked through. By pressing both armature fastening screws against running direction and subsequent tightening the specified magnetic gap is adjusted (see "Technical Data" chapt. 1) (at the linear feeder type SLF 1000 at both magnets). After that pull out the round pins. In case there are no round pins, the magnetic gap can be adjusted from below (perhaps after dismounting the complete linear feeder from the supporting structure or from the supporting table) by means of a feeler gauge or distance pieces according to the prescribed magnetic gap.

Notice
At a turning knob position of 100% at the control unit and a correctly adjusted magnetic gap the magnet may not dash against the armature. In case this happens, proceed according to point 5.2 (remove springs).

The aim of the adjustment is:

If the required conveying speed is achieved at a controller position of 80 %, the conveying speed must always increase when a weight plate is removed.

Notice
Take care that the number of springs per spring assembly does not differ by more than 2-3 springs

6 Specifications for the design of the track

As the vibrator is sufficiently flexible owing to the use of aluminim profile, the conveying tracks should be of a very light design. Only in case of conveying tracks projecting over the vibrator (in the feeding area max. 100 mm, in the discharge area max. 200 mm) the design of the conveying track must be correspondingly inflexible to distortion. In order to achieve an additional, lateral distortion-inflexibility, a one-piece supporting plate of 4 - 6 mm thick aluminium should be screwed on the linear feeder profiles. by replacing
the linear feeder profiles you get the small "S" or broad "B" construction type.

The higher the feeding speed is, the larger must the clearance between upper edge of the part to be conveyed and the lower edge of the cover of the conveying track be chosen. If possible the clearance must be brought to the largest permissible measure. When installing and fastening the conveying tracks the following points must be observed:

- Install closely to the upper edge of the vibrator
- If possible put it on the center of the aluminium profile
- Choose solid, rigid screwings (minimum M5)
- In order to achieve a higher conveying speed the linear feeder can be installed with a slight inclination of approx. 3-5°.
- Under no circumstances use loose or hinged, unscrewed covers.

The conveying track may also consist of several short sections, which are assembled and scrwed down on the vibrator. At the feeding side flat chamfers facilitate passing of the workpiece from one to the other conveying track section.

The construction consisting of several sections is especially recommended for the use of hardened or surface-hardened conveying tracks (low distortion manufacture)

Very light conveying tracks can be realized by using aluminium-rails or aluminium profiles. The necessary abrasion resistance can be achieved by segments made of hardened spring band steel, which are screwed in or on. This segments are available on request at the manufacturer.

7 Maintenance

The linear feeders are generally maintenance-free. They should, however, be thoroughly cleaned in case they are considerably dirty or after fluids have been spilled over them.

- For that first unplug the mains plug.
- Clean the inside of the linear feeder, especially the magnetic gap.
- After the mains plug has been plugged in, the linear feeder is ready for operation again.

8 Stockkeeping of spare parts and after-sales service

The range of the spare parts available may be taken from the separate spare parts list.
In order to guarantee quick and faultless handling of the order, please always state the type of equipment (see type plate), number of pieces needed, spare part name and spare part number.
You will find a list of our service addresses on the back page of the cover.

9 What to do, if... (Instructions for trouble-shooting)

Attention
The control unit or the connecting terminal box may only be opened by an electrician. Before opening the a.m. devices, the mains plug must be unplugged!

In case the conveying track has no steady running speed or height amplitude, but at the discharge side a higher running speed or height amplitude than on the feeding side, the spring angle has been wrongly adusted to the gravity center angle (see chapt. 5.2.2.) In this case proceed as follows:

- Adjust the spring angle larger at all spring assemblies
- Displace the counterweight "F" against running direction
- Install additional weight plates at the counterweight
- Install additional weight "G" into the oscillating profile

In case the conveying track has no steady running speed or height amplitude, but at the feeding side a higher running speed or height amplitude than at the discharge side, the spring angle is wrongly adjusted to the gravity center angle (see chapt. 5.2.2) In this case proceed as follows:

- Adjust the spring angle smaller at all spring assemblies
- Displace the counterweight "F" in running direction
- Dismount additional weight plates at the counterweight
- Dismount additional weight "G" from the oscillating profile

If the running behaviour is unsteady at a steady conveying track speed and if the material to be transported jumps too much between bearing surface and cover, the gravity center angle and the adjusted spring angle of the total system is too large and consequently the height amplitude too high. In this case proceed as follows:

- Change the gravity center angle (make it more "flat"), by displacing the counterweight "F" against the running direction, installing additional weight plates at the counter weight, installing an additional weight in the oscillating profile and choosing a lighter design for the conveying track if necessary.
- Adjust the spring angle according to the gravity center angle.

If the running behaviour is unsteady especially at material to be conveyed with large surface or which is fouled by oil, the gravity center angle and the adjusted spring angle of the total system is too small. The height amplitude is too low. Owing to that the motion of projection cannot take place and in case of oily workpieces the adhesive power is higher than the projectile power, i. e. the workpiece cannot be lifted.

In this case proceed as follows:

- Change the center of gravity angle (make it "steeper"), by displacing the counterweight "F" in running direction, dismounting additional weight plates at the counter weight, dismounting the additional weight from the oscillating profile.
- Adjust the spring angle according to the new gravity center angle

In case the conveying track cannot be adjusted according to the above mentioned criteria, and, if eg. lateral vibrations or in certain areas "dead points" occur, the track stiffness is insufficient. The points of impact or separation work towards each other or asymmetrical structural parts of the track lead to unsteady running behaviour. In this case proceed as follows:

- Mount additional stiffening ribs
- Connect impact or separation points by screwings
- Provide asymmetrical structural parts with counterweights or replace them by lighter materials.

Trouble	**Possible cause**	**Remedy**
Linear feeder does not start when being switched on	Mains switch off Mains plug of the control unit is not plugged in Connecting cable between linear feeder and control unit is not plugged in Fuse in the control unit defective	Switch on the mains switch Plug in the mains plug. Plug in the 5-pole plug at the control unit Replace the fuse
Linear feeder vibrates slightly 	Turning knob at the control unit is set to 0% Transport securing device has not been removed Wrong vibration frequency **Attention**: in case a linear feeder SLL 400 is operated without a bridge in a 7-pole plug, the control unit and the magnet is in danger!	Set the controller to 80%. Remove the transport securing device. Check, whether the code in the plug of the linear feeder is correct (see type plate and "technical data" (chap. 1)
After a longer operating time the linear feeder does no longer come up to the conveying capacity required	Fastening screws of the linear track have worked loose Screws at one or two spring assemblies have worked loose Magnetic gap misadjusted Vibrator displaced towards the countermass	Retighten the screws. Tighten the screws (tightening torques see "technical data" (chapt. 1) Readjust the magnetic gap (gap width see "Technical Data" (chapt. 1) Readjust the vibrator (see chapt. 5.2.1)
Linear feeder produces loud noise	Foreign bodies in the magnetic gap	Switch off the linear feeder and remove the foreign bodies, after that check the magnetic gap adjustment
Linear feeder cannot be adjusted to a constant conveying speed	The spring constant of the oscillating system has changed. The linear feeder works close to the resonance point	Readjust the linear feeder. Springs must be removed. See chapt. 5, adjustments

D

Rhein-Nadel Automation GmbH

Reichsweg 19/23 Ÿ D - 52068 Aachen
Tel (+49) 0241/5109-159 Ÿ Fax +(49) 0241/5109-219
Internet www.rna.de Ÿ Email vertrieb@rna.de

Rhein-Nadel Automation GmbH

Zweigbetrieb Lüdenscheid
Nottebohmstraße 57 Ÿ D - 58511 Lüdenscheid
Tel (+49) 02351/41744 Ÿ Fax (+49) 02351/45582
Email werk.luedenscheid@rna.de

Rhein-Nadel Automation GmbH

Zweigbetrieb Ergolding
Ahornstraße 122 Ÿ D - 84030 Ergolding
Tel (+49) 0871/72812 Ÿ Fax (+49) 0871/77131
Email werk.ergolding@rna.de

CH

HSH Handling Systems AG

Wangenstr. 96 Ÿ CH - 3360 Herzogenbuchsee
Tel +(41) 062/95610-00 Ÿ Fax (+41) 062/95610-10
Internet www.rna.de Ÿ Email info@handling-systems.ch

GB

RNA AUTOMATION LTD

Hayward Industrial Park
Tameside Drive, Castle Bromwich
GB - Birmingham, B 35 7 AG
Tel (+44) 0121/749-2566 Ÿ Fax (+44) 0121/749-6217
Internet www.rna-uk.com Ÿ Email rna@rna-uk.com

E

Vibrant S.A.

Pol. Ind. Famades C/Energia Parc 27
E - 08940 Cornella Llobregat (Barcelona)
Tel (+34) 093/377-7300 Ÿ Fax (+34) 093/377-6752
Internet www.vibrant-rna.com Ÿ Email info@vibrant-rna.com